

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
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50014-042

PROTECTIVE UNDERGARMENTS  
HAVING ANCHORED POCKETED-  
SLING STRUCTURES AND  
MANUFACTURING METHOD  
THEREFOR

Related Applications

The present application claims the benefit of U.S. Provisional Application  
Serial No. 60/121,960, entitled "PROTECTIVE UNDERGARMENTS HAVING  
ANCHORED POCKETED-SLING STRUCTURES AND MANUFACTURING  
5 METHOD THEREFOR", filed on February 25, 1999, whose contents are  
incorporated by reference.

Field of the Invention

This invention relates generally to protective undergarments, and more  
particularly to reusable underwear having, or retrofitted with, novel body fluid  
10 containment and fecal matter collection structures.

Background of the Invention

To enhance the fluid and fecal containment properties of protective  
underwear, U.S. Patent Nos. 5,137,526 and 5,409,476, issued to Fredrica Coates,  
15 describe protective underwear having a waterproof or water-resistant sling with its  
front and rear ends adjoined through connecting pieces to an outer shell. This sling

isolates body fluids from spreading to the outer region of the shell by implementing elastic on the outer perimeter edge of the sling or waterproof gussets mounted on opposite sides of the sling. The elasticized and gusseted sling design is effective, although the volume of fluid able to be contained in this structure is limited.

5           As an improvement, in U.S. Patent No. 5,722,127, issued to Fredrica Coates, the sling is enhanced to form a deeper pocket and fasteners of greater adjustability to retain the garment to the wearer. However, even with improved fit and a deeper inner pocketed sling, there still remains a need for a greater circumferential area for fluid and fecal matter containment. Hence, further disclosed in the '127 patent is a  
10   pocketed sling for retaining fluid absorbent pads. And Coates Application Serial No. 08/792,735, filed on January 31, 1997, discloses a frontal hidden pocket added to a connecting frontal piece for enhanced circumferential area and hence fluid absorption. However, a need continues to exist for an alternative device for increasing circumferential area for fluid containment. It is also preferred to provide  
15   body fluid containment structures, within what will appear to be conventional underwear, particularly desirable for an adult wearer.

          There continues to exist a need for more effective protective underwear, and garments for bed wetters or adults, that provide containment while preserving underwear of aesthetic appeal. Prior devices, sewn or heat sealed to garments, are  
20   uncomfortable or tend to leak at places in the garment where holes are formed by sewing needles used during assembly.

### Brief Description of the Drawings

Fig. 1 is a perspective view showing one embodiment of a reusable diaper with anchor pocketed sling, produced in accordance with the principles of the invention and shown open into position to be worn.

5        Fig. 1A is a cross-sectional view of a diaper with anchored sling, taken along the line 1A-1A in Fig. 1.

Fig. 1B is a cross-sectional view of a diaper with anchored sling taken along line 1B-1B in Fig. 1.

Fig. 1C shows the anchor cloth overlying the outer shell, as a first step in  
10        manufacture of the reusable diaper.

Fig. 1D shows the anchor cloth with a mounted pocket sling, together with cutting away of the corner of the pocketed sling and folding of the corner of the pocketed sling for formation of the pocketed sling structure.

Fig. 1E is a view of the pocketed sling, with the four corners of the pocket  
15        removed,

Fig. 1F shows a double pocket sling, where a second pocket is formed and anchored by a first anchored pocket.

Fig. 1G shows the four corners of the pocketed sling joined and formed with pocket edge covered by an elastic.

20        Fig. 1H shows assembly of an anchored pocket sling to the anchor cloth overlying a shell.

Fig. 2 is a perspective view showing another embodiment of the invention with anchor pocket sling having extended cuffed pockets.

Fig. 2A is a cross-sectional view of the diaper of Fig. 2, with anchored pocketed-sling and extending cuff pockets, taken along line 2A-2A in Fig. 2.

5 Fig. 2B is a plan view of the anchor cloth overlying the shell cloth.

Fig. 2C shows the anchor cloth with mounted fabric piece to form a cuffed pocketed sling.

Fig. 2D shows mounting and folding of the cuffed pocketed sling on its anchor cloth.

10 Fig. 2E shows assembly of a cuffed pocketed sling to the anchor cloth and shell.

Fig. 3 shows another embodiment of the invention, with fasteners for anchoring a pocketed sling, produced in accordance with the invention.

15 Fig. 3A shows a removable pocketed sling with an attachment mechanism at the reverse side of the sling.

Fig. 3B is a cross-sectional view of the sling shown in Fig. 3.

Fig. 3C shows the anchor cloth with a snap attachment for the pocketed sling structure.

20 Fig. 3D shows a pocketed sling cloth with corresponding snap attachment mechanism.

Fig. 3E is a view of the anchor cloth having a Velcro® type fastening attachment mechanism.

Fig. 3F shows the pocketed sling cloth with corresponding Velcro® attachment tabs.

Fig. 4 shows another embodiment of an anchored sling and strip anchors, produced in accordance with the invention.

5 Fig. 4A shows the anchor cloth with attached strips in position to hold the pocket.

Fig. 4B shows a mounted pocket sling, held by anchor strips on an anchor cloth and overlying shell cloth.

Fig. 5 depicts another embodiment of the invention, in which a lady's or  
10 man's underpant is fitted with a pocketed sling anchored by an anchor cuff.

Fig. 5A shows the pocket sling structure of Fig. 5.

Fig. 5B is a view of the cuffed anchor piece attached to an anchored pocket seamed and attached to the underlying pant as an anchor cloth.

Fig. 6 is a view of another embodiment of ladies' or men's underpant, with a  
15 pocketed sling anchored by an anchor cuff in both frontal and rear portions of the garment.

Fig. 6A is a view of the pocketed sling structure of Fig. 6.

Fig. 6B shows the cuff anchor piece attached to an anchored pocket, attached to the underpant fabric as an anchor cloth.

20 Fig. 7 is a plan view of an embodiment of a reusable diaper having snaps, with a submerged pocket sling produced in accordance with the principles of the invention, and opened in position to be worn.

Fig. 7A is a cross-sectional view of a diaper taken along line 7A-7A of Fig.

7.

Fig. 7B shows an anchor cloth holding the submerged pocket, with pocket attached on the underside of the anchor cloth and overlying a shell cloth with snap

5 fasteners.

Fig. 8 is a plan view of another embodiment of a man's boxer underpant, open at its side seams, laid flat with a submerged pocket-sling structure retrofitted and produced in accordance with the principles of the invention.

Fig. 9 is plan view of a belted undergarment with submerged pocket,  
10 produced per this invention.

#### Best Mode For Carrying Out The Invention

Referring to Figs. 1A-1H, a reusable diaper in accordance with one embodiment of the invention, designated generally by numeral 10, comprises a  
15 waterproof or water-resistant (breathable type fabric) diaper shell 12 within which is retained a fluid containment pocket 50, positioned to be located about the groin when worn by an infant or adult. Referring to Fig. 1A, the diaper is formed of three layers; a waterproof or water-resistant outer shell 12, inner liner 16 generally soft to the touch and optionally of fluid absorbent fabric, and a layer 50 forming an  
20 anchored pocketed-sling 50 of water-resistant or waterproof material 13. The two outer layers of the diaper shell 12 and 16 are generally of the same shape, and the anchor cloth 16 is on the inside of, and aligned with, the outer shell 12. This lining

16 forms an attachment mechanism at a stitch line 17 to anchor the pocketed sling 50 to outer shell 12. The outer shell 12 and its inner liner 16 are joined at the leg hole by a leg elastic strip 18, which convolutes the two layers, stitched at line 20 and holding the two layers together to form a leg hole 22. The inner pocketed sling is positioned and attached (stitched) centrally to the inner liner 16 only. Hence, the stitching does not pierce shell 12.

Shell 12 has a fastener 24 of loop-type filamentary material attached to the outer frontal surface of diaper 10. In the rear portion of the outer corners of diaper 10 are fasteners 26, affixed to the diaper 10 such that hook-type filamentary material 30 closes onto loop material 28 to protect the hook material from accumulating lint during laundering, with the hook and loop materials being separated from each other by a space 26 to form a hinge. The elastic strip 32 conforms the layers to fit the waist and buttocks region of the wearer through gathers 34.

Stitch line 42, which may be replaced by heat sealing, assembles the corners of the pocket. This assembly may also be accomplished by folding the corners 21 inward to the reverse side, and then sealing to establish an inside seam.

Referring to Fig. 1A, which is a cross-sectional view of outer layer 12 connected to the inner layer 16 at elastic strip 18, stitch line 17 adjoins pocket 50 to the inner liner 16. Elastic trim 40 forms an adjustable pocket opening to receive fluid into a fluid absorbing pad (not shown). Stitch line 42 connects the corners of

the pocket 50, as previously described, and the pocket is inserted within elastic strip 40 to present a smooth finished surface 42 to contact the wearer.

Fig. 1B is similar to Fig. 1A, but depicts the presence of loop-type filamentary material 24 positioned on the outer surface of shell 12. The loop material 24 fastens the garment to the wearer when hook tabs 30, shown in Fig. 1, close onto the front of the garment.

Figs. 1C-1H show the construction method by which three layers of fabric come together to form a leak proof undergarment interior. In Fig. 1C, a piece of anchor cloth 16 is positioned over outer shell 12, similarly configured, as a first step in the manufacture of anchored pocket 50. In Fig. 1D, stitch line 17 pierces the cloth 16 in a rectangular pattern and attaches to hold pocket 50 to its anchor cloth now stitched centrally. The edges or sides of the fabric 13 take shape into a pocket-shape 50 as corners 21 are removed, and the sides become seamed at 42. The pocket may alternatively take shape by forwarding the corners at 42A and 42B, the folded cover 21A therefore is not removed.

In Fig. 1E, bulk is advantageously reduced in the garment by removing the triangular corners at 21A shown in Fig. 1D. In Figure 1F, an additional piece of fabric at 50B is optionally added at stitch line 17A (for either waterproof or absorbing purpose) at pocket 50 as it overlays the stitch line 17 of the primary pocket 50.

In Fig. 1G, pocket 50 is now formed as seamed, joined or heat sealed at 42, so as to keep the pocket sides properly shaped, and with elastic 40 convoluting the edge of the pocket.

In Fig. 1H, the three layers are now in position to be joined at stitch line 17B.

5 The layers are held together for assembly of the garment to its fasteners and leg hole elastic strips, as seen in Figs. 1, 1A and 1B.

Refer now to Fig. 2, depicting another embodiment of the invention, in which the outer shell is the same, but sling configuration different compared to the embodiment of Fig. 1. In Fig. 2, diaper 10 is again composed of three layers; outer  
10 layer 12 of water-resistant material, inner layer 16 that is not water-resistant and an inner fabric 72 cuffed to form pocketed sling 68 of water-resistant material. The rectangular pocketed sling 68 has folded fabric 72 at end cuffs 60 and 61, the rear cuff 60 being formed by folding outer perimeter edge 80 of fabric 72 inward, and the two raw edges of the fold inserted into elastic strip 62. Elastic strip 62 extends  
15 longitudinally to frontal cuff pocket 61, where an alternative folded edge 61A joins outer pocket edge 71 at seam line 71A. Frontal pocket 61 is formed as raw edge 71 joins with raw edge 61B at seam line 71 on the interior side of the pocket. Hence, cuff 60 is formed in the rear portion of the diaper by adjoining folded edges within the elastic, as compared to frontal pocket cuff 61 where elastic 62 covers edge 71  
20 and together they are joined to folded edge 61B at seam line 71 on the interior side of the formed cuff pocket. Optionally, the elastic may be omitted on underside at 71 as finished edge is formed by seamline 71 rather than elastic 62. The rear cuff outer

corner may be stitched down at stitch line 62A. The entire pocketed-sling 68 is attached to anchor cloth 16 in the central portion of diaper 10 at stitch line 70, which forms a stabilizing rectangular attachment of cuffed pocketed-sling 68 to its anchor cloth 16. Leg hole 22 and fasteners 24 and 26 are identical to those depicted in Fig.

5 1.

Referring to Fig. 2A, which is a cross-sectional view of pocket 68, outer layer 12 is connected to inner layer 16 at elastic trim 18, and held fast by zig-zag or straight stitching at 20. Cuff pocket 60 is formed as the sidewall of fabric 72 of pocket 68 bends at outer edge 80 into the point of stitch line 70.

10 Manufacture is carried out first by overlaying cloth 16 on waterproof cloth 12 as its liner, as shown in Fig. 2B. In Fig. 2C, liner 16 and fabric piece 72 are stitched in an hourglass fashion at 70 to anchor cloth 16. Opposite ends of waterproof fabric piece 72 are overlock stitched at 80.

Fig. 2D shows the opposite ends being folded inward to form cuff 60 and  
15 folded backward forming cuff 61. At cuff 60, the folded sides will meet and be encased in elastic strip 62, bending the wall of fabric 72 inward. The opposite end of the cuff is formed in a different fashion, as end 80 of cuff 61 is folded backward, and the two raw edges 61B and 71A are encased in elastic strip 62.

In Fig. 2E, the cuff is reversed and seam 61 is made flush with the fabric raw  
20 edges, and elastic is now on the inside of pocket 68. Optionally, a tacking 62A can be added to hold elastic down at cuff 60. The formed pocket 68 adjoined to cloth

16, overlies outer shell fabric 12, and is ready for assembly as a garment of protective underwear.

In another embodiment of the invention, depicted in Fig. 3, diaper 10 is composed of two layers, with liner 16 and shell 12 connected at elastic strip 18 by stitching 20. The absorbing pocketed-sling 50 of Fig. 1 is detachable through an optional fastener material, such as Velcro® in the form of a rectangular sewn piece 86, or alternatively as snaps 120. In Fig. 3B, the Velcro® fastener is mounted at line 82 on anchor cloth 16, whereas in Fig. 3A, the pocketed sling 50 is shown detached from its anchor cloth to expose the underlying attachment. Examples are snaps 121 to be matched within 120 of Fig. 3 when coupled for use, or Velcro® fastening strips 66 stitched at 84 for coupling with complementary Velcro® strip 86, stitched at 82.

Figs. 3C-3F show optional placement of the fastening means for enabling the pocketed sling to be detached from its anchor cloth. Fig. 3C shows the mounting of four male snaps 120 overlying shell 12, Fig. 3D the pocket piece 50 with corresponding female straps 121, and Fig. 3E Velcro® loop material mounted on anchor cloth 16 overlying cloth 12. And in Fig. 3F, a pocket 50 is formed with hook fastener strip 84 stitched at 66 to be coupled with a rectangular member 86 when the pocket is fully formed, as shown in Fig. 1, where attachment is stitching.

In another embodiment, depicted in Fig. 4, diaper 10 is composed of two layers of fabric: an inner layer overlying a shell 12. The pocketed sling device described in Figs. 1-3 is now anchored to the liner cloth 16 with strips of fabric 64A,

66A, 67A, positioned on one side of the anchor cloth 16, and on the opposite side anchor strips 64B, 66B and 67B are positioned to hold and stabilize the pocket. In this figure, the anchor strips are each tacked to the anchor cloth 16; 64A is tacked at 62C, 66A at 66C, 67A at 67C, 64B at 64C, 66B at 66C and 67B at 67C. As the first  
 5 step in the stabilization of pocketed sling 68, Fig. 4A shows the tacking on the anchor cloth 16, and in Fig. 4B the strips each bend inward into the elastic strip 62 as the pocket is formed. Just as in Fig. 2, elastic strip 62 is exposed at cuff 60, but not at cuff 61. Hence, strips 64A and 64B are inserted in the elastic 62 at one end and at the opposite end are inserted in the seam 61B with elastic 62 on the underside of cuff  
 10 61, holding the seam together.

In another embodiment, depicted in Fig. 5, the (anchor) liner cloth 16 of the previously described embodiments now becomes 16A the outermost surface of protective underwear diaper 11 in that it establishes conventional underwear, opened at side seams 102. This, for example, could be a lady's panty (or a man's jockey  
 15 pant) by simply closing seams 102. However, what is important is not merely the outside appearance. With the waterproof or water-resistant shell being omitted, the same principles of the invention are applied to develop more aesthetic devices.

Still referring to Fig. 5, an anchor cuff 160 of triangular shape holds pocketed sling 500 in position to be worn. Pocketed sling 500 is of a waterproof or  
 20 water-resistant material. Cuff piece 160 is stitched on the inside of the garment 11 at 162. This cuff is held to layer 16A, the garment or panty fabric 16A, in a triangular stitch pattern 162. At the widest end of the triangular cuff 160, pocketed sling 500 is

attached at seam line 163 by an overlock finishing stitch. Leg hole 22 is covered by elastic 118. Elastic strip 5 finishes the outer edges of the garment 11.

In the rear portion of the garment, pocketed sling 500 is stabilized with stitching 170 on opposite sides of structure 500. The stitching anchors the sling structures as well as waterproof region of the garment. The resulting design is most advantageous for women who need a protective panty when in supine position.

The sidewalls of pocket sling 500 are brought together at seam 104. This process of forming the pocketed sling structure is best as seen in Figs. 5A and 5B.

In Fig. 5A, the shape of pocket 500 is formed as sides 104A and 104B are bent inward and joined at seam 104. Elastic strip 400 is applied to fit the groin of the wearer as pocket 500 elasticizes around the pubic area. The opposite end of the pocket 500 is folded and stitched at lines 403 and 404, preferably covered by an elastic strip that improves fit and water resistance. In Fig. 5B, the cuff 160 is joined to the end of pocket 500, at stitch line 162. Folded walls 104A and 104B are seamed at 104, creating a top and under surface of the pocket now both held together by overlock stitching 162. The panty will be seamed at 102, and is now ready for application of elastic to the outer edge of the protective underwear.

Figure 6, another embodiment of similar structure to Figure 5, incorporates the same elements of structural formation; 16A, a both panty and cloth for a pocketed sling, the same elastic 5 is finishing outer waist portions of the garment, side seams 102, when seamed are forming protective panty 11. The anchored pocket of Figure 6 now carries central connecting pieces 160 at frontal and rear

portion, now stitched centrally to 16A at stitch line 163. Anchor strips 620 are inserted in both sides of leg hole, elastic 18 at central portion of leg hole elastic 18 and then connected, inserted in, elastic of pocket elastic 40. Manufacturing of garment strips 620 may be in reverse order of assembly by first being inserted in

5 pocket elastic 40 and then attached to central portion of the panty (stitched over top of elastic 18). These connecting pieces 620, anchor the pocket 502 without piercing the fluid absorbing or containing area of pocket 502. The connecting pieces suspend the pocket 502 centrally at opposite ends. The pocket 502 is connected at opposite ends by overlock stitching 108. Elastic 18 finishes the leg hole. Elastic 40

10 terminates within seam 104, and the outermost edge of the pocket is finished by overlock stitch 162.

In Figure 6A, pocket 502 shows the attachment of side anchor strip 62 in a seam line 620A.

In Figure 6B, center anchor pieces 620 are now encased in elastic 400A in

15 stitch line 620A.

In Figure 7, there is yet another embodiment of an anchored pocket sling. This embodiment is identical to Figure 1 with the exception that the pocketed structure is attached, suspended below the anchor cloth; therefore, the pocket 50 resides between the shell 12 and anchor cloth 16.

20 Figure 7 also depicts side snap fasteners for fastening sides of garment together for wearing. Side snap fasteners 100, 102 are used in this garment as an alternative to Velcro® fasteners shown in earlier figures.

Waist elastic 110 is also positioned beneath anchor cloth 16A, so as to protect skin of wearer in the event that the elastic may be wide and need fabric over it. Overlock stitching 105 connects 16A with outer shell 12 at the outermost edge of the garment.

5           On the underside, dotted lines represent the now suspended and floating pocket, 50, of same structure as pocket 50 of Figure 1. It is a hidden pocket, suspend by the joining of perimeter edge 13 to anchor cloth 16A at elastic 40. Side seams 42 are joined as in Figure 1, but no stitch line 17 is necessary in this embodiment as the base of pocket floats. This feature further enhances waterproof property of pocket.

10           In Figure 7A, pocket 50 is suspended between 16A and 12A. Elastic 40 holds pocket perimeter edge with anchor cloth circular edge 43.

In Figure 7B, another view of manufacture of submerged pocket design, anchor cloth 16A overlies shell 12A.

In Figure 8 the submerged pocket structure of Figure 7 is applied to a male  
 15   boxer short 22. The submerged pocket 50 includes the principles of the invention disclosed in Figure 6 including submerged pocket 50, with seamed corners 42, suspended between anchor cloth 16A and waterproof piece 12A held on opposite sides by elastic 18. The addition to this variation of the invention is anchor strip 52 which stabilizes the protective sling in the rear portion of boxer short 22. Boxer  
 20   short 22 has an elastic waist 110 and a sling device with submerged pocket 50 held to central frontal interior portion of boxer pant 22 at stitching 118.

5

What is Claimed Is:

1. A protective undergarment, comprising:  
an outer layer of fluid-resistant material shaped to conform to the buttock  
and leg region of a user;  
an anchor layer secured to the outer layer and having a shape conforming  
5 to that of the outer layer; and  
an inner layer of fluid-resistant material with all sides folded inward and  
interconnected to form a pocket attached to the anchor layer.
2. A protective undergarment as in claim 1, wherein a base portion of the  
pocket is positioned on a surface of the anchor layer.
3. A protective undergarment as in claim 1, wherein the pocket is secured  
to the anchor layer by stitching.
4. A protective undergarment as in claim 1, wherein a surface of the  
anchor layer is formed with an opening conforming in shape to the shape of the  
pocket, only a periphery of the pocket is secured to the anchor layer and the  
pocket is suspended through the opening toward the outer layer.
5. A protective undergarment as in claim 4, wherein the periphery of the  
pocket is stitched to the anchor layer.
6. A protective undergarment as in claim 4, wherein the periphery of the  
pocket and anchor layer are joined at an elastic strip.

7. A protective undergarment as in claim 1, wherein the pocket is held to the anchor layer by a releasable fastener.

8. A protective undergarment as in claim 7, wherein the releasable fastener comprises a filamentary or snap fastener.

9. A protective undergarment as in claim 1, wherein the pocket is formed by a rectangular piece of material, the corners of which are folded inward and outer edge of the pocket covered by an elastic strip.

10. A protective undergarment as in claim 1, wherein the pocket is formed by a rectangular piece of material, with triangular portions near the corners of the pocket removed, adjacent sides of each triangular portion are joined together and outer edge of the pocket covered by an elastic strip.

11. A protective undergarment as in claim 9, wherein opposite ends of the pocket are cuffed and the elastic strip covers edges of the cuffs to establish an elasticized adjustable pocket opening.

12. A protective undergarment as in claim 9, wherein the pocket is held to the anchor layer by a releasable fastener.

13. A protective undergarment as in claim 10, wherein the pocket is held to the anchor layer by a releasable fastener.

14. A protective undergarment as in claim 9, wherein the pocket is held to the anchor layer by connecting pieces of material.

15. A protective undergarment as in 4, wherein the inner layer of material suspended through the opening forms a pocket that is wider than the opening and floats with respect the outer layer.

16. A protective undergarment, comprising:

a first, outer layer of fluid-resistant material;

a second layer of material having its peripheral edge attached to the first layer, having a shape conforming to that of the first layer and having a central

5 opening;

a third layer of material attached only at its outer edge by an elastic strip to the second layer and extending beneath the opening toward the second layer, the third layer being proportioned relative to the opening such as to form a pocket beneath the second layer that is larger than the opening.

PROTECTIVE UNDERGARMENTS  
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ABSTRACT OF THE DISCLOSURE

A reusable infant or adult diaper comprising an inner anchored pocketed sling structure adjoining an outer shell or pant-type garment. The outer shell or garment fits the wearer's torso and legs, and the inner anchored sling fits and conforms to the wearer's pubic region. One embodiment of the invention includes

5 mechanisms to fasten and remove the anchored sling from underwear. Other embodiments provide novel mechanisms to stabilize and/or anchor the sling when retrofitted to conventional underwear.

Figure 1

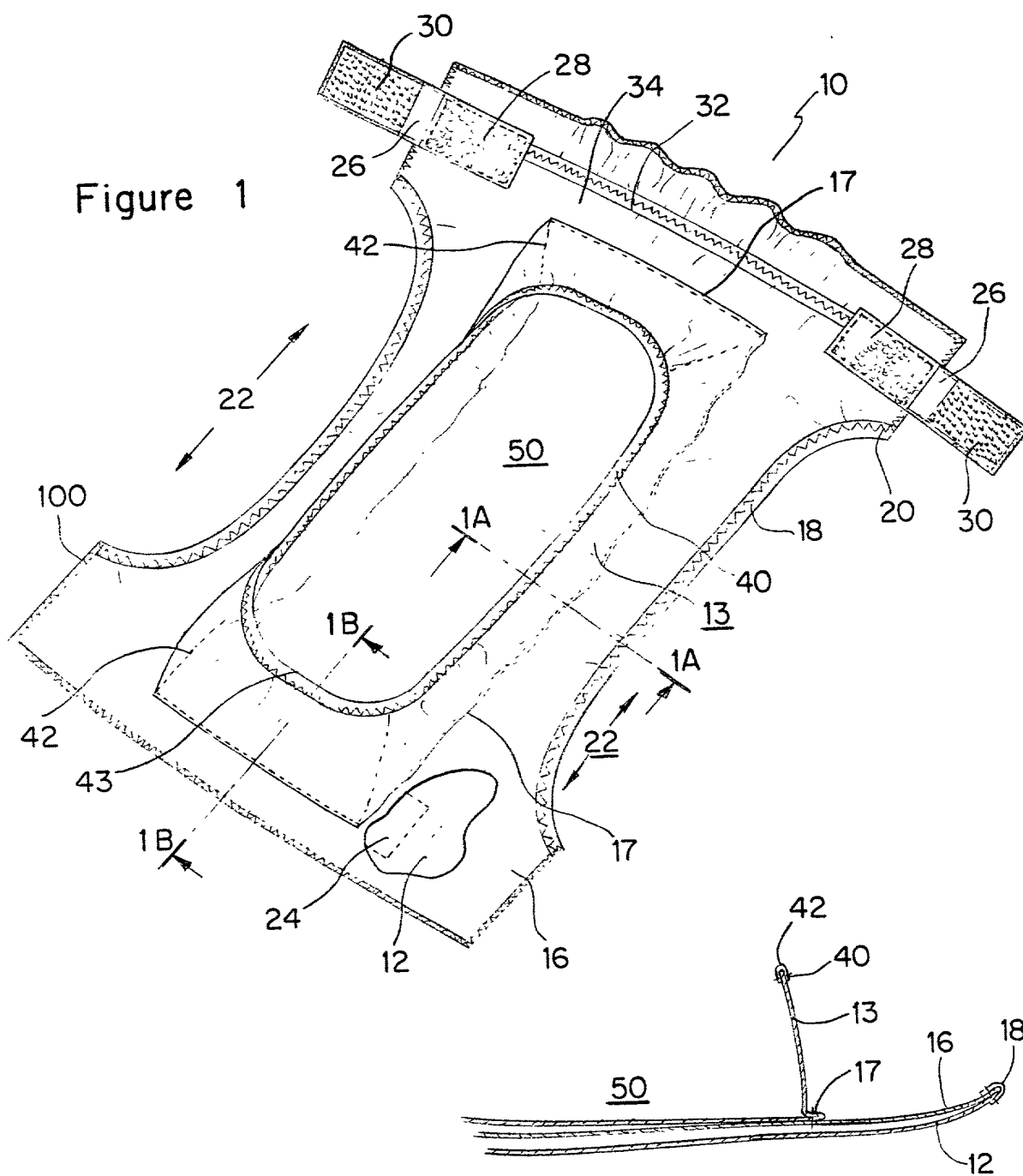


Figure 1A

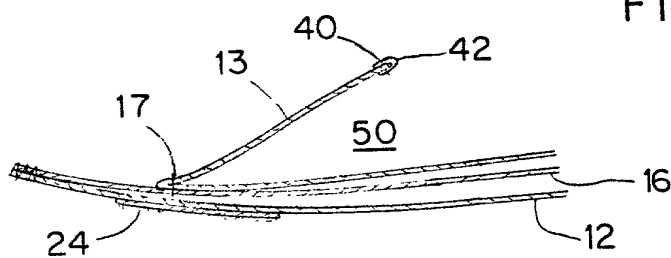


Figure 1B

Figure 1C

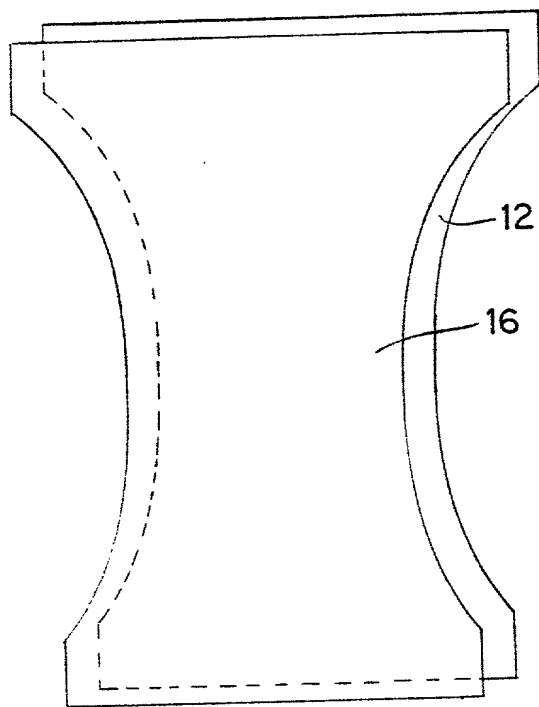


Figure 1D

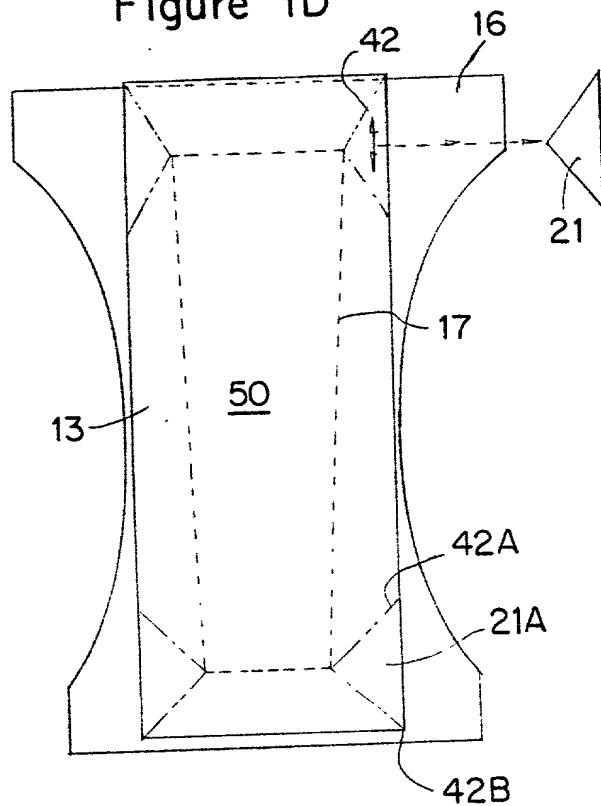


Figure 1E

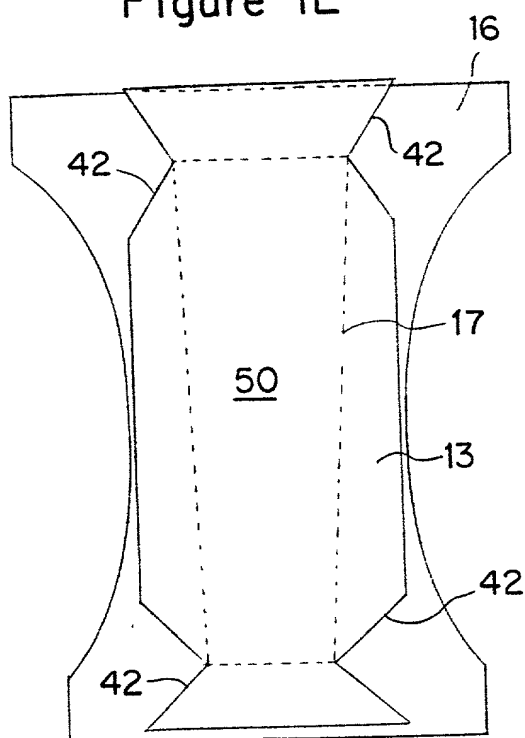


Figure 1F

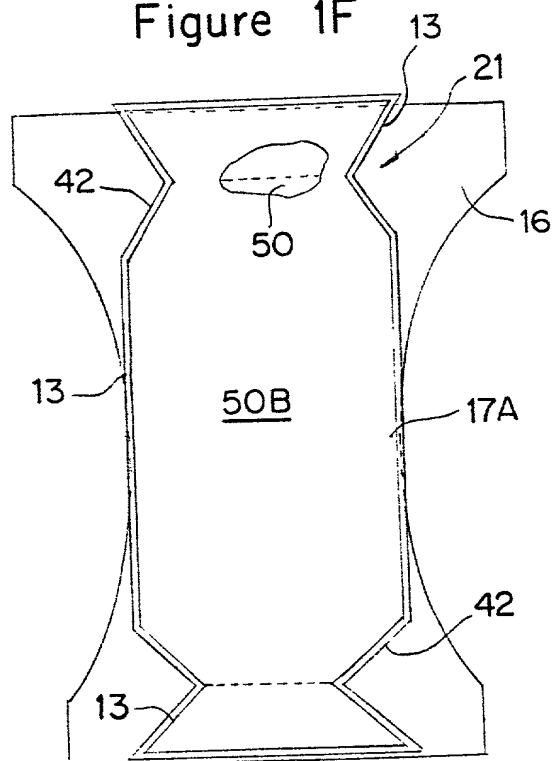


Figure 1H

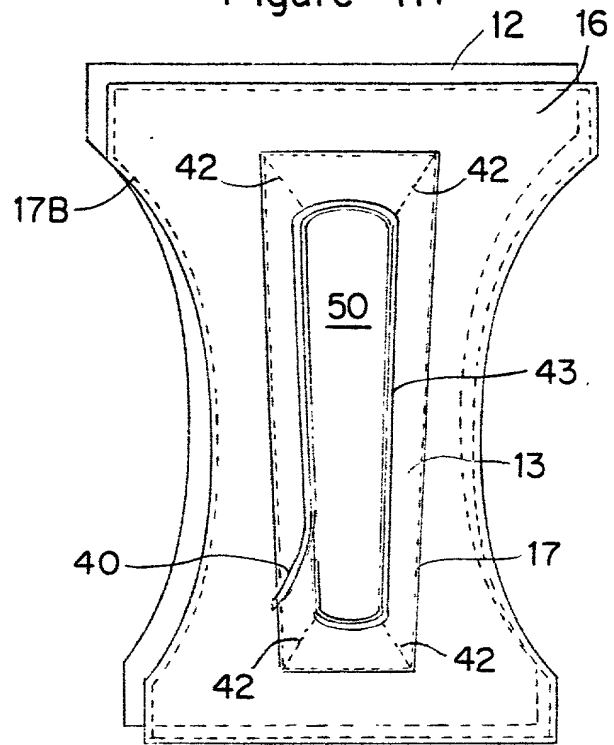
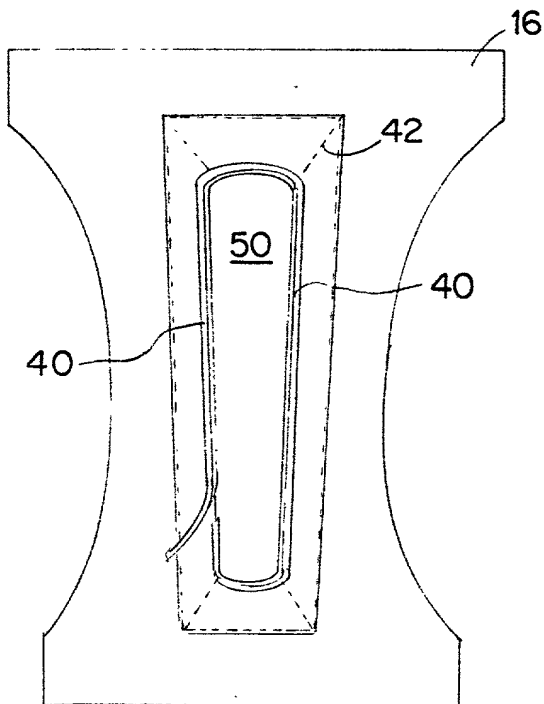


Figure 1G



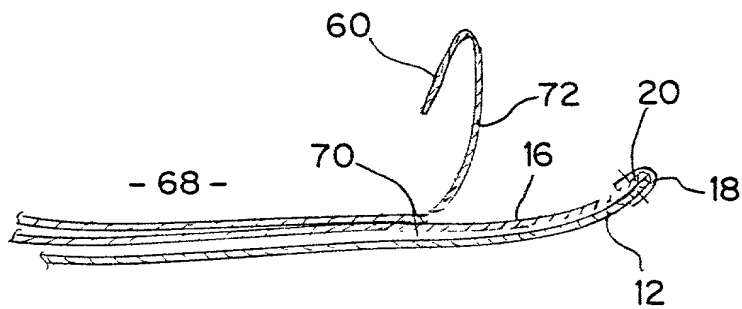
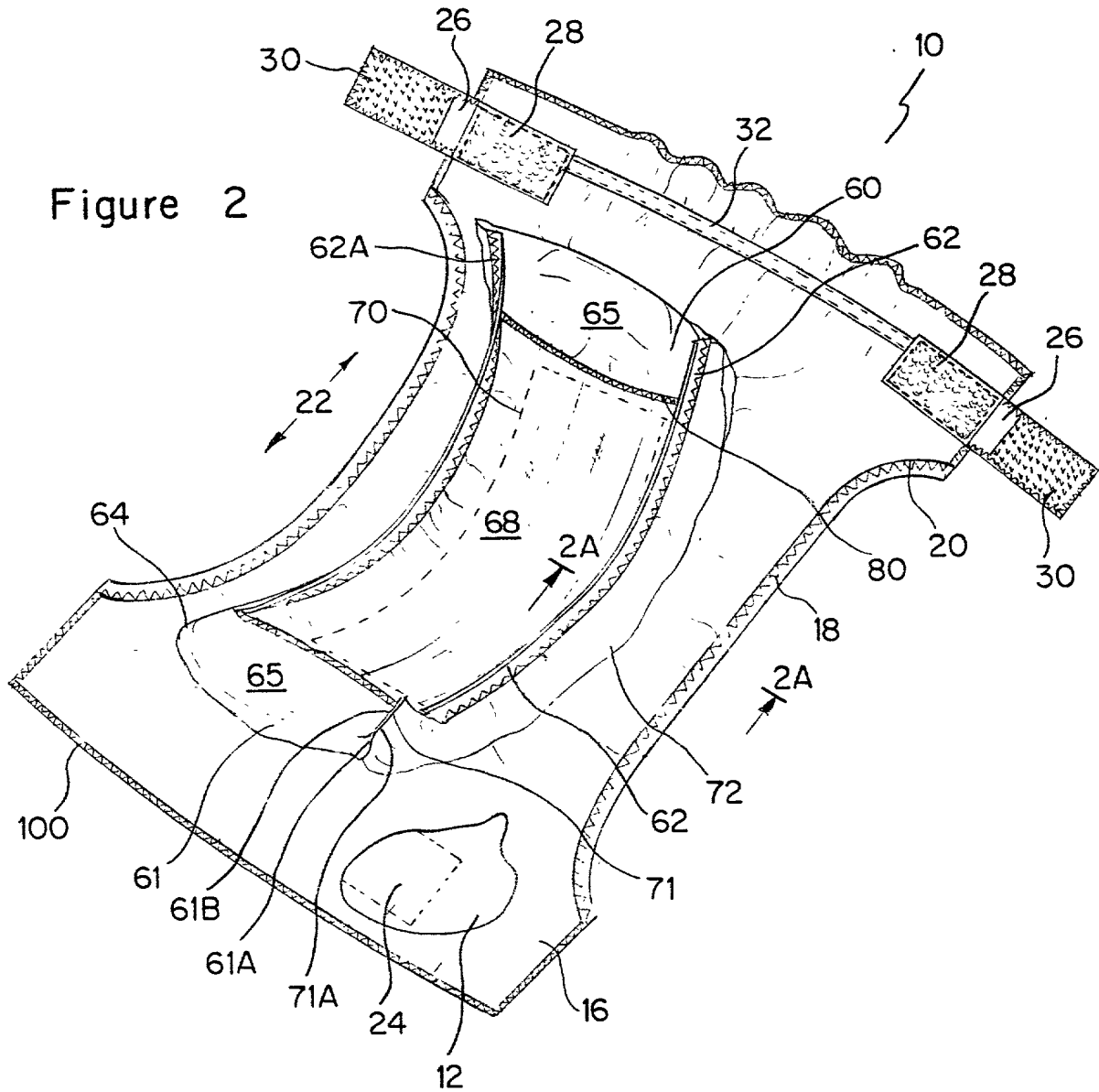


Figure 2B

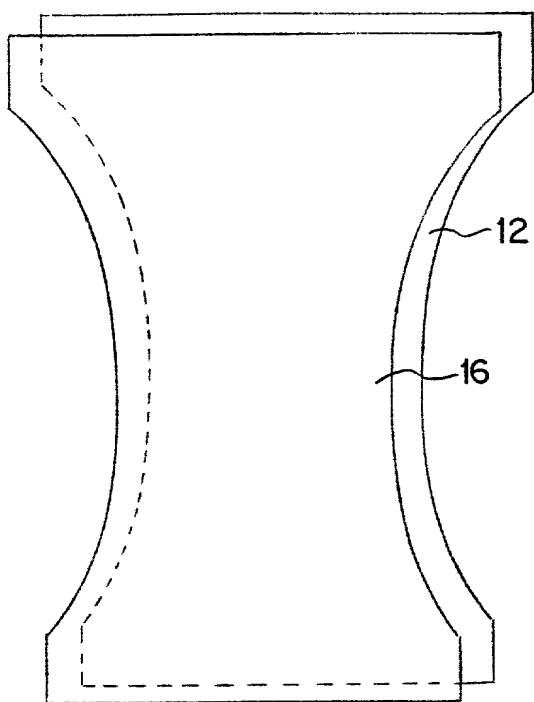


Figure 2C

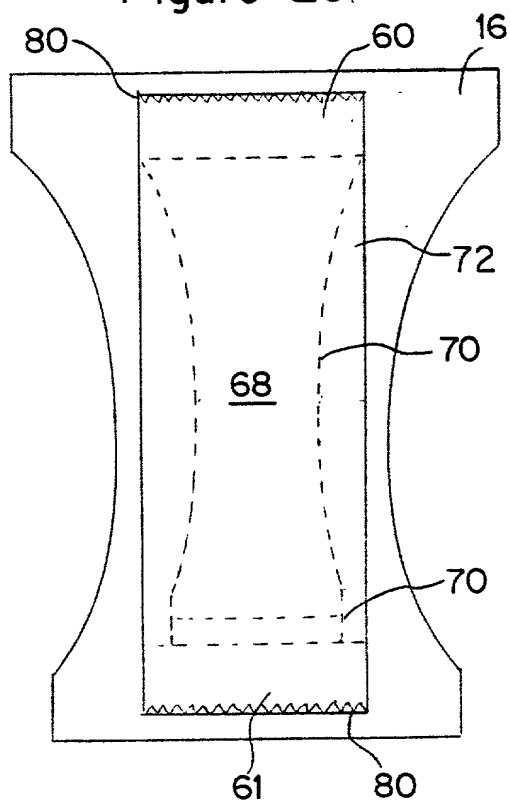


Figure 2D

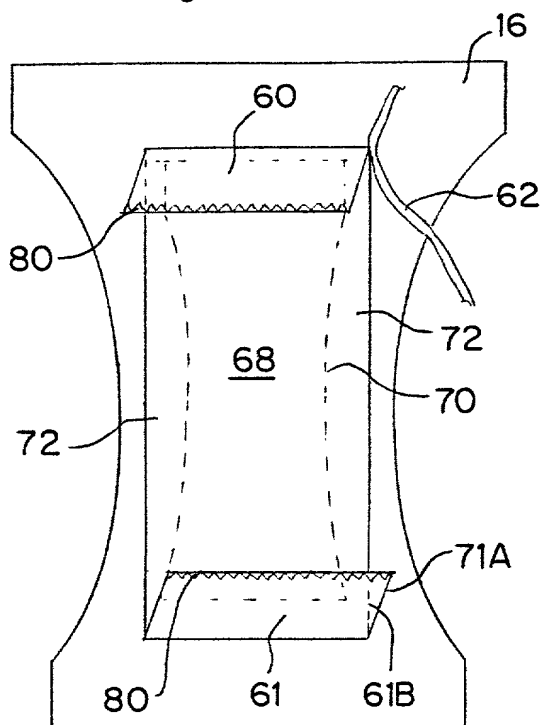
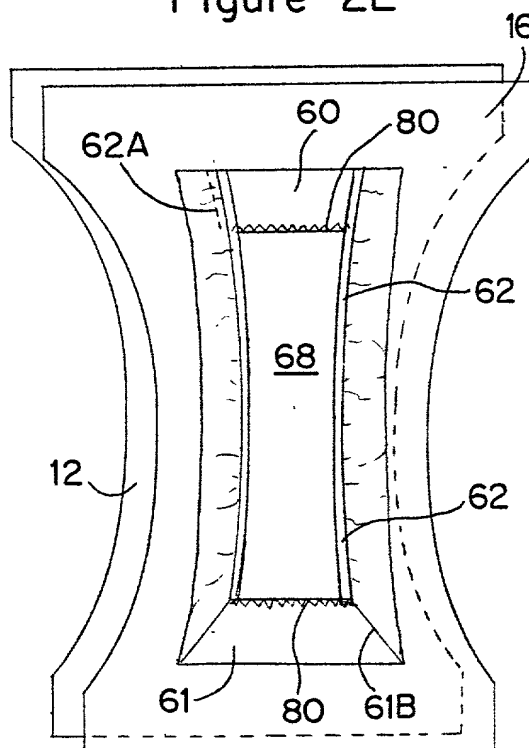


Figure 2E



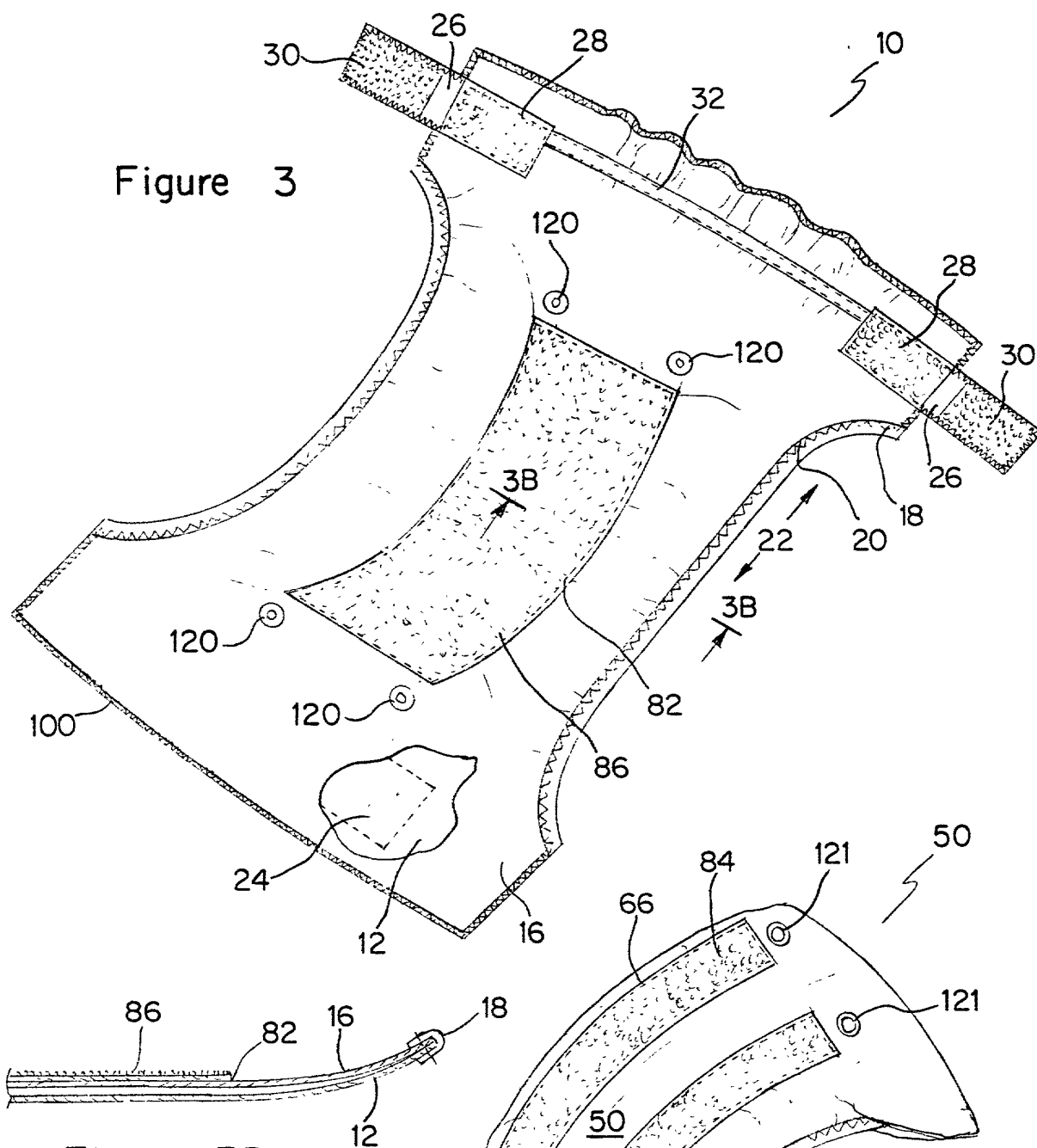


Figure 3B

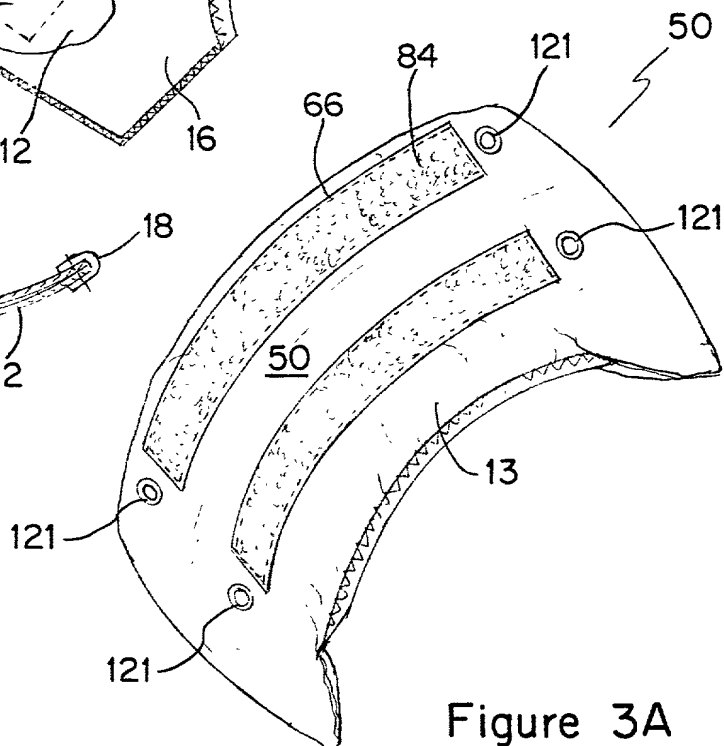


Figure 3A

Figure 3C

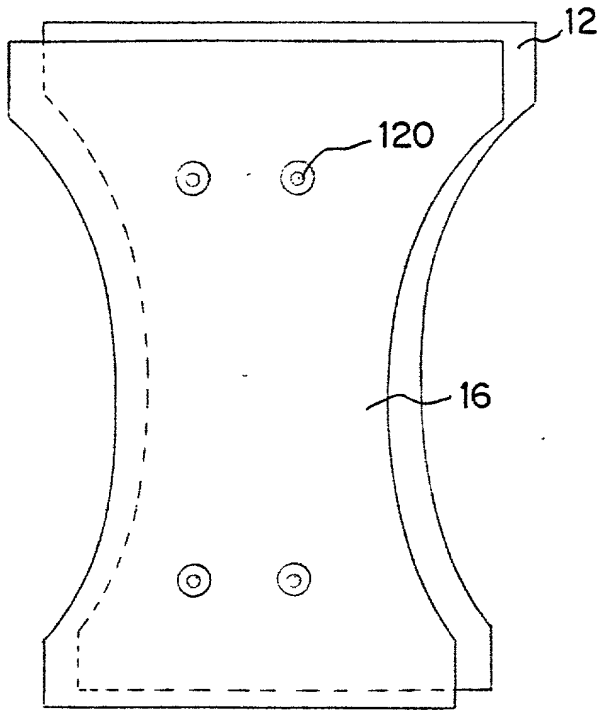


Figure 3D

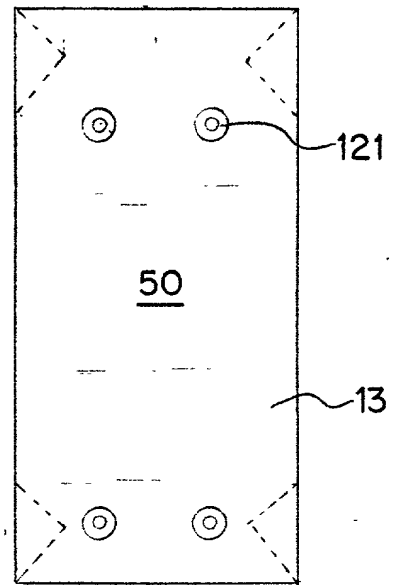


Figure 3E

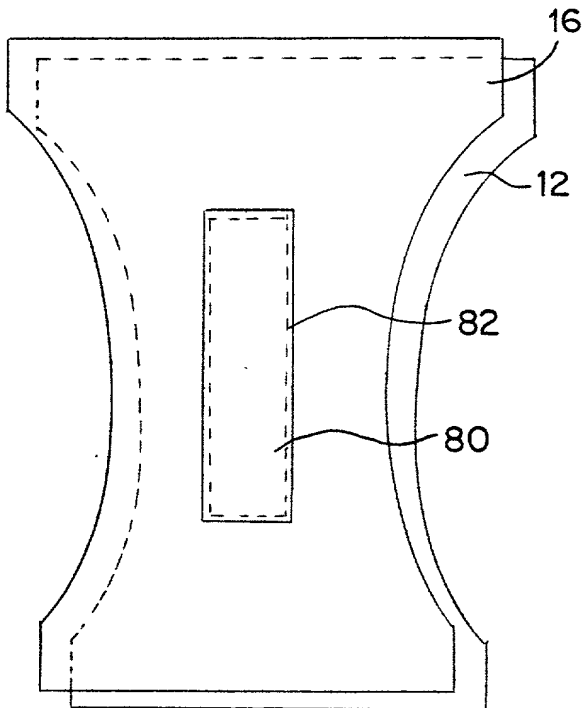


Figure 3F

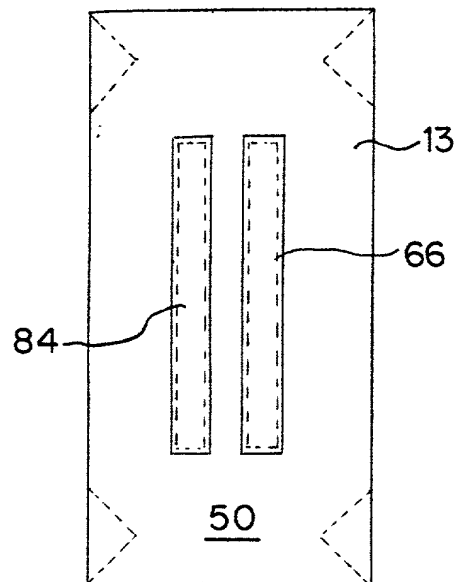


Figure 4

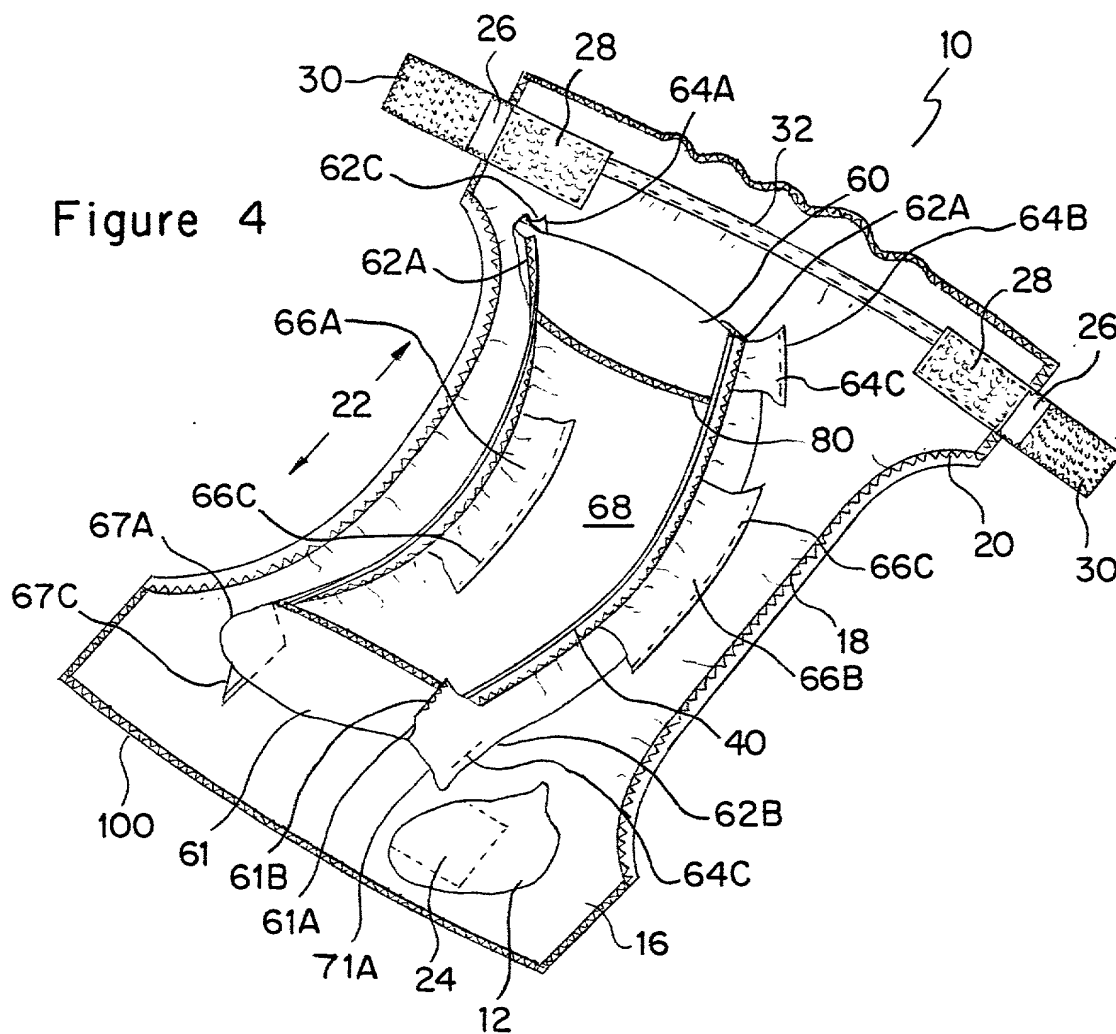


Figure 4A

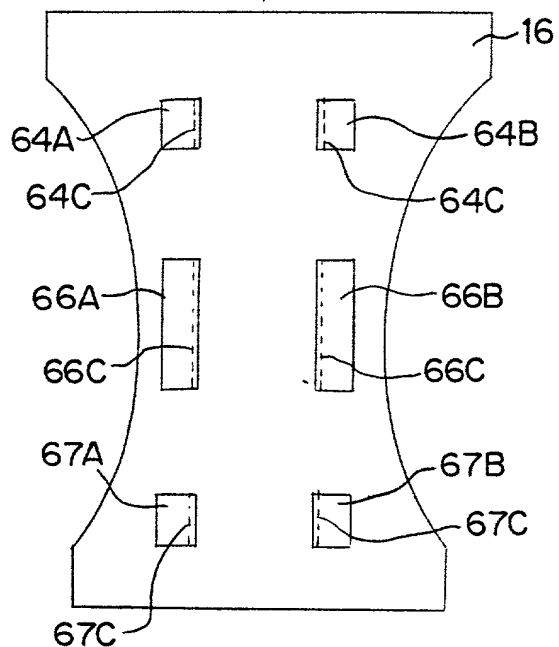


Figure 4B

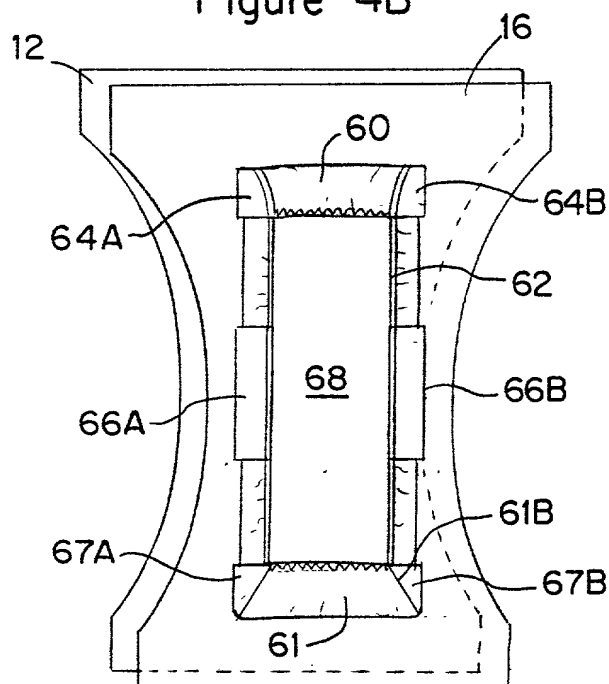


Figure 5

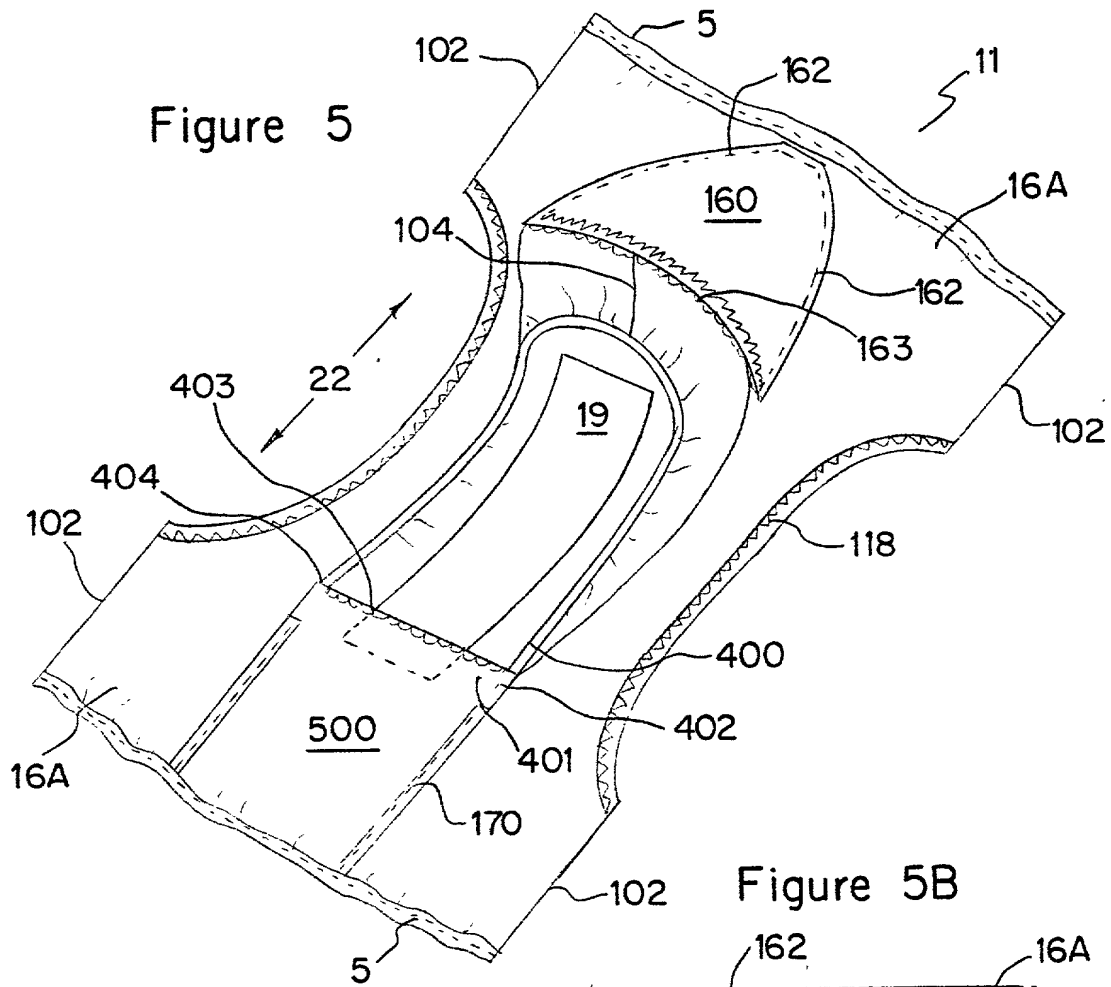


Figure 5B

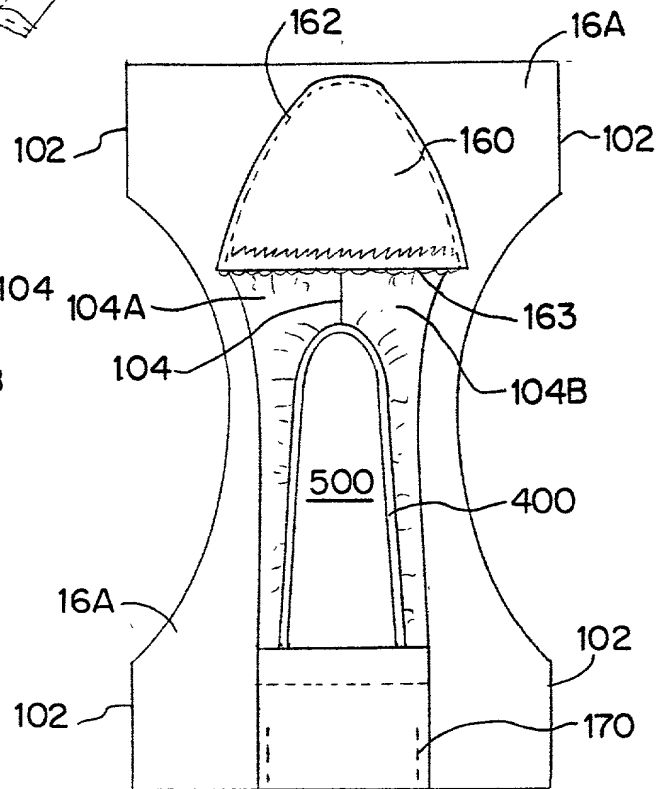


Figure 5A

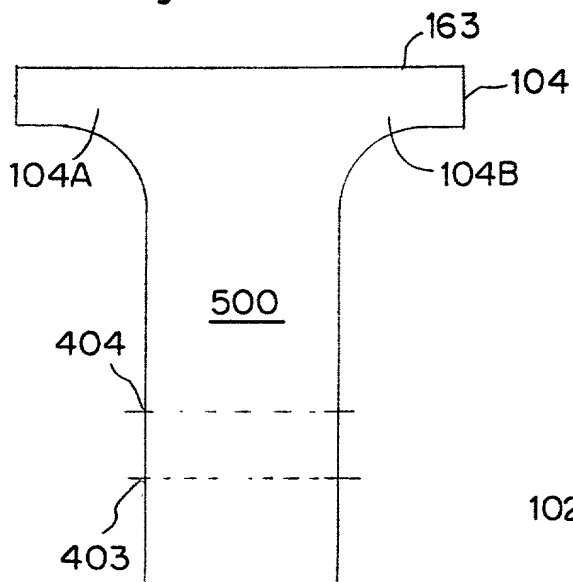


Figure 6

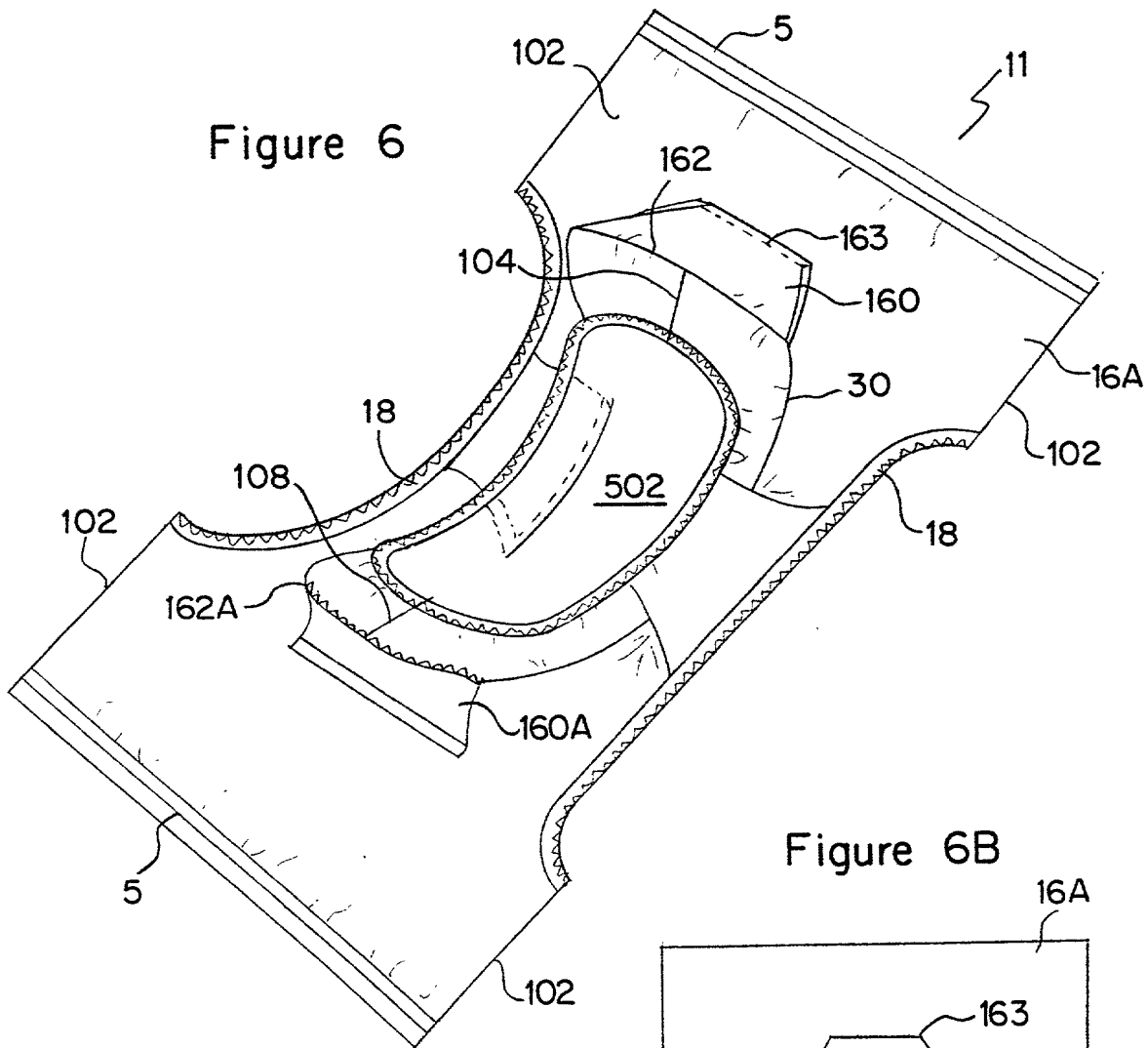


Figure 6B

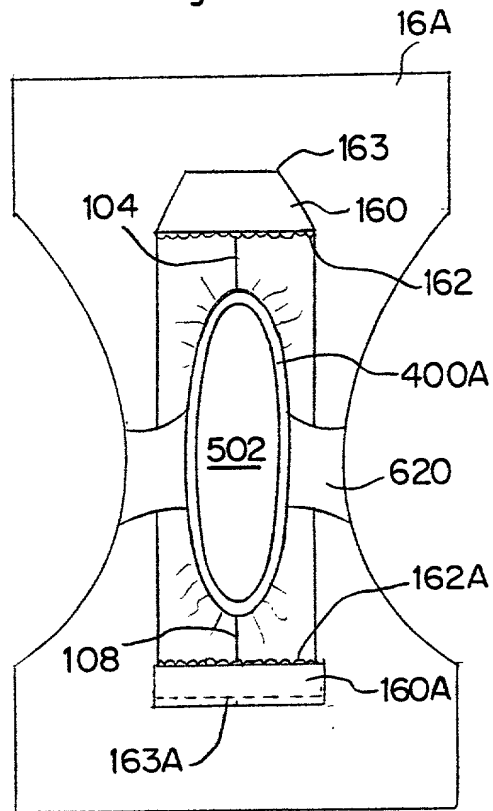


Figure 6A

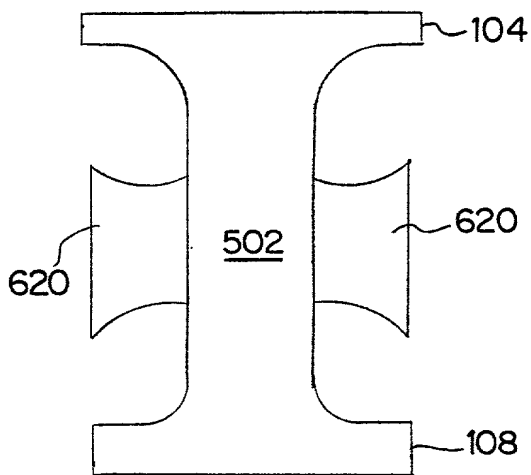
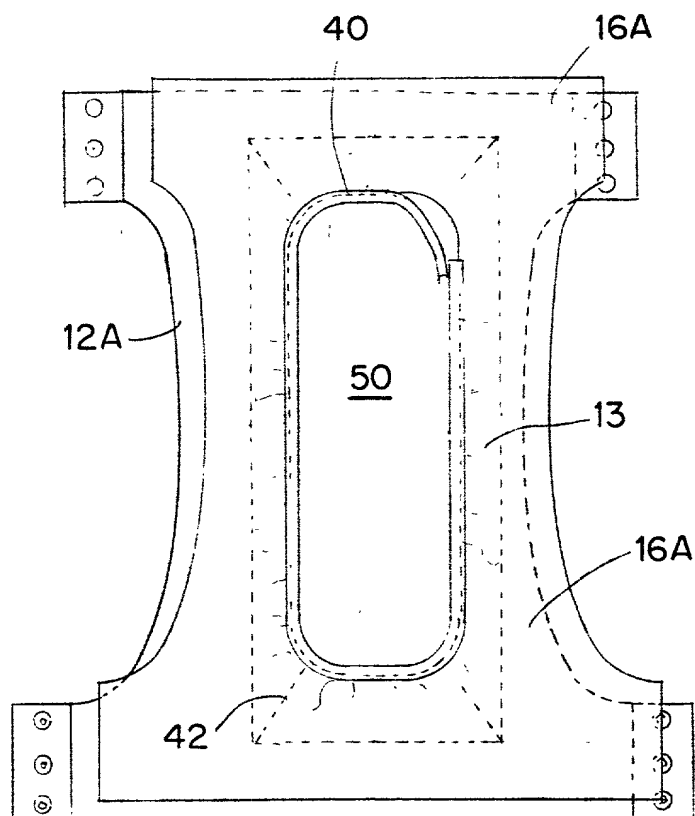




Figure 7B



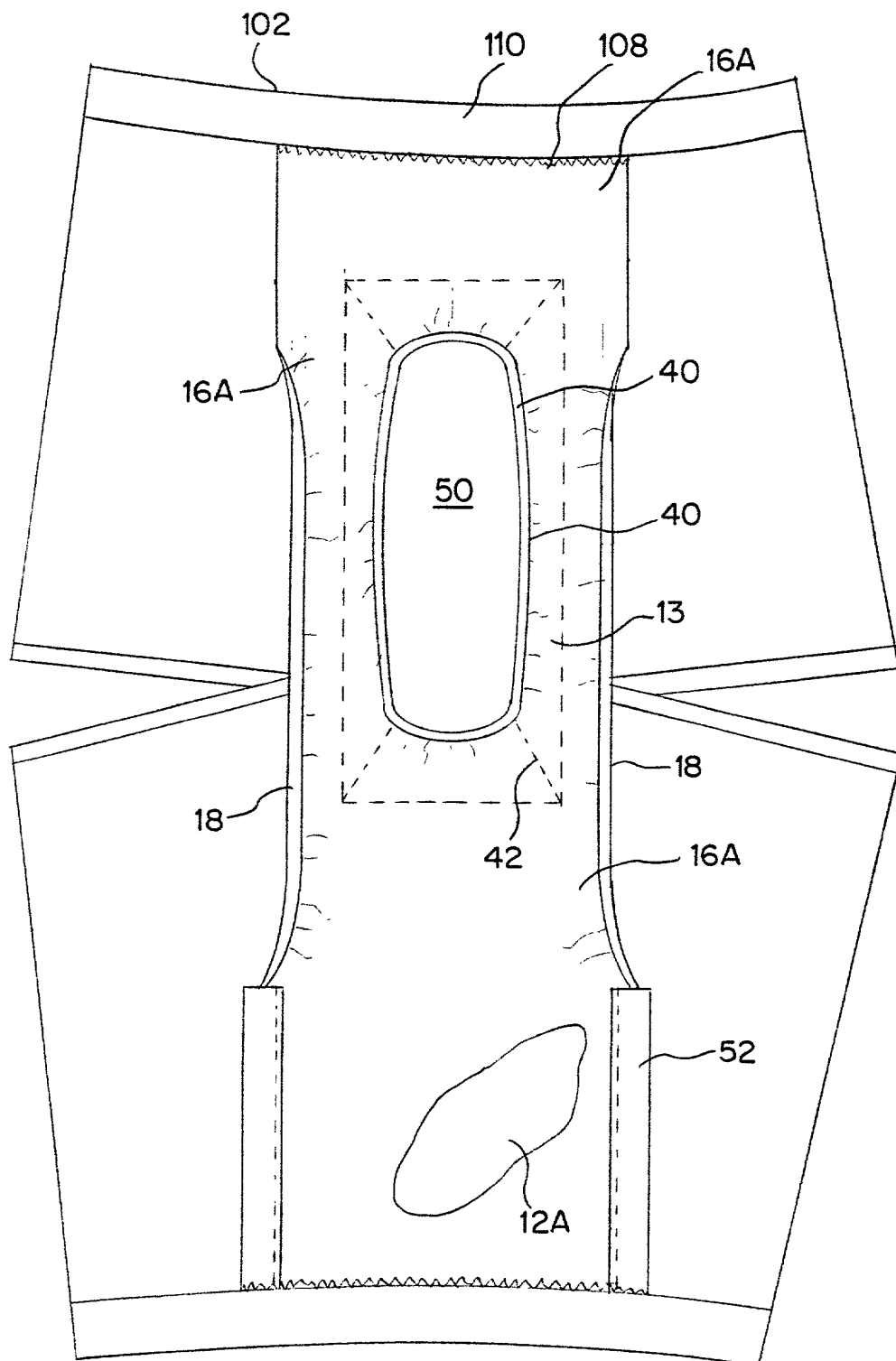
[illegible]

Figure 9

